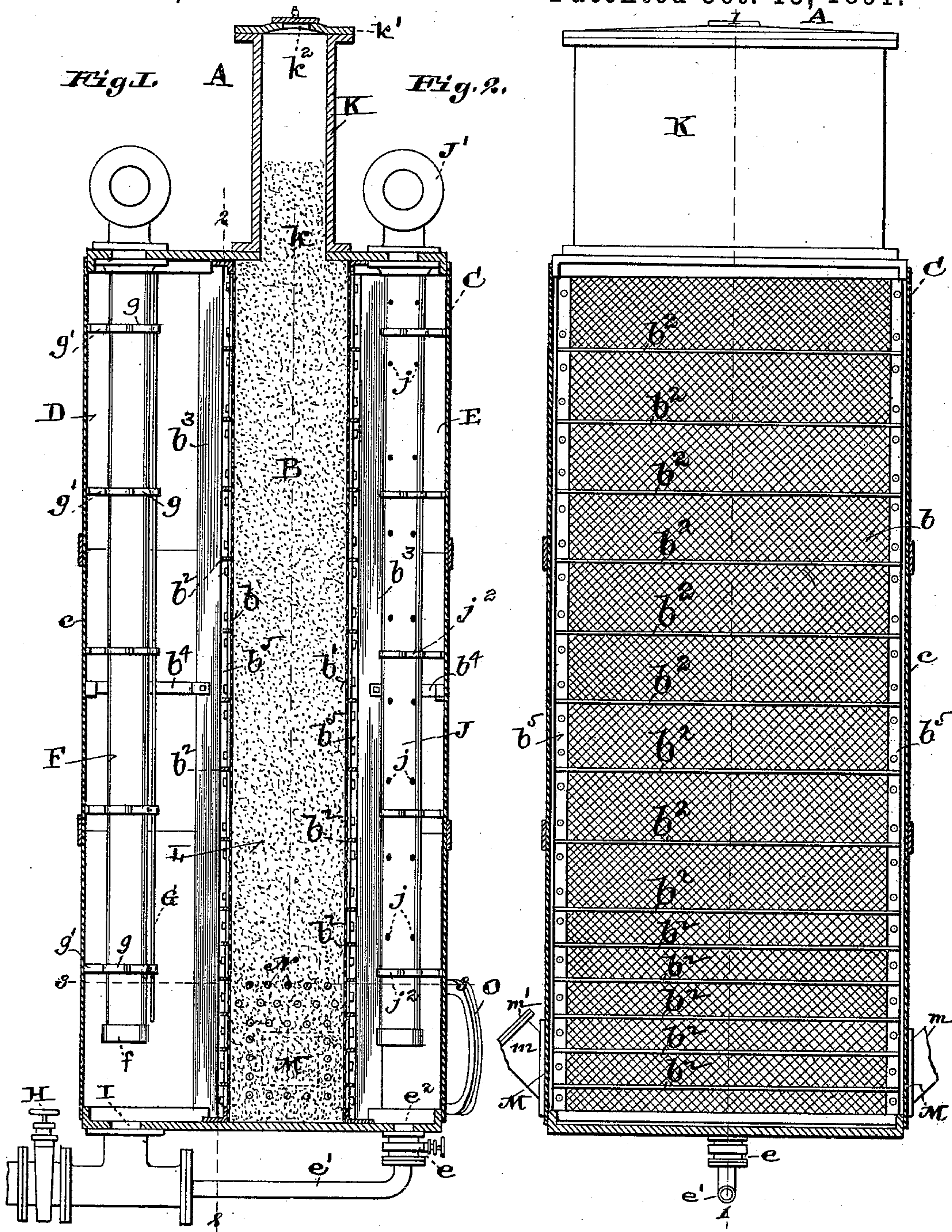


2 Sheets—Sheet 1.

Patented Oct. 13, 1891.

No. 461,303.



Attest:  
S. W. Sanford  
R. J. Rye

*Inventory*  
*Lewis F. Andrews*  
*by C. S. Moody*  
*his atty.*



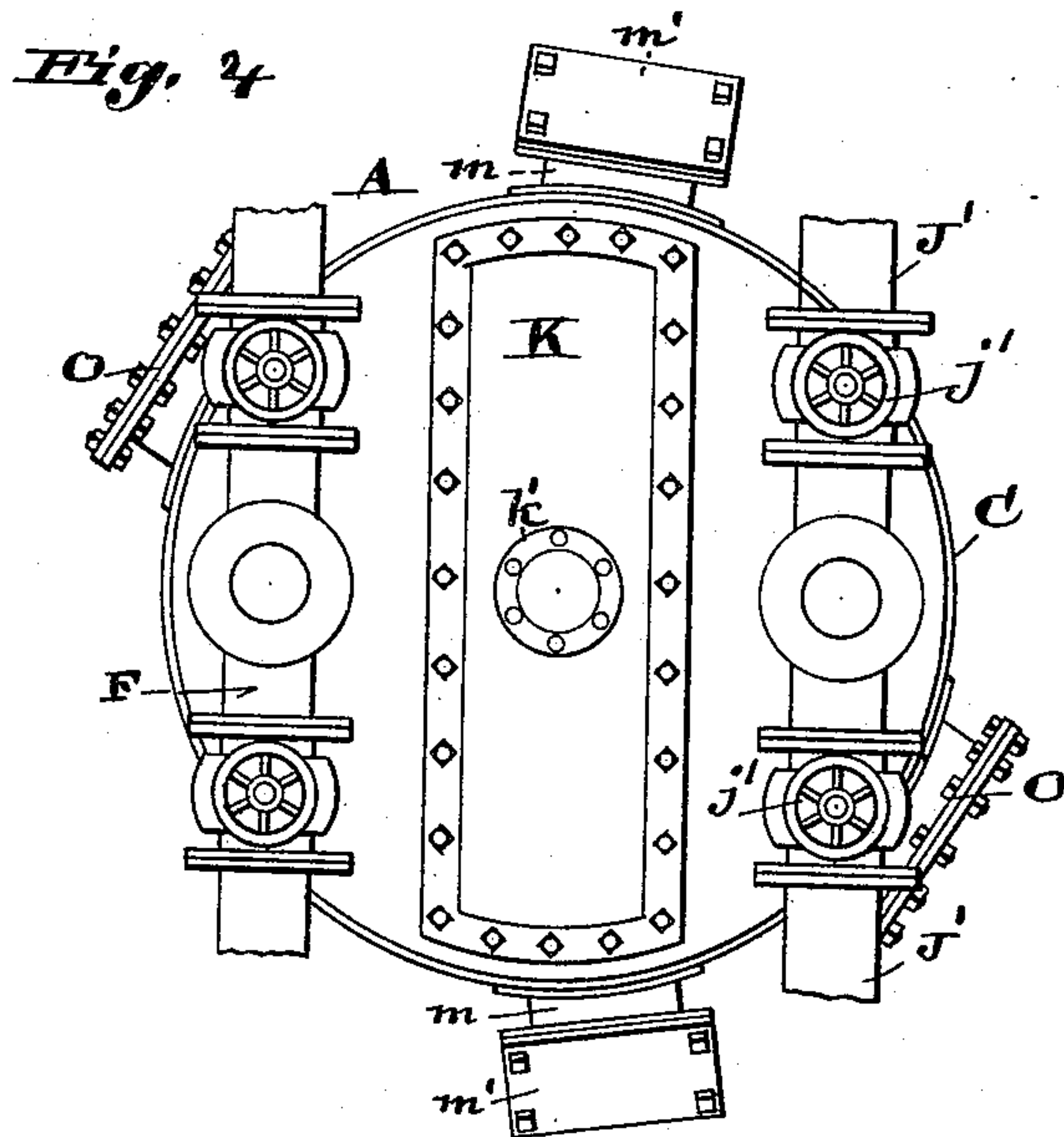
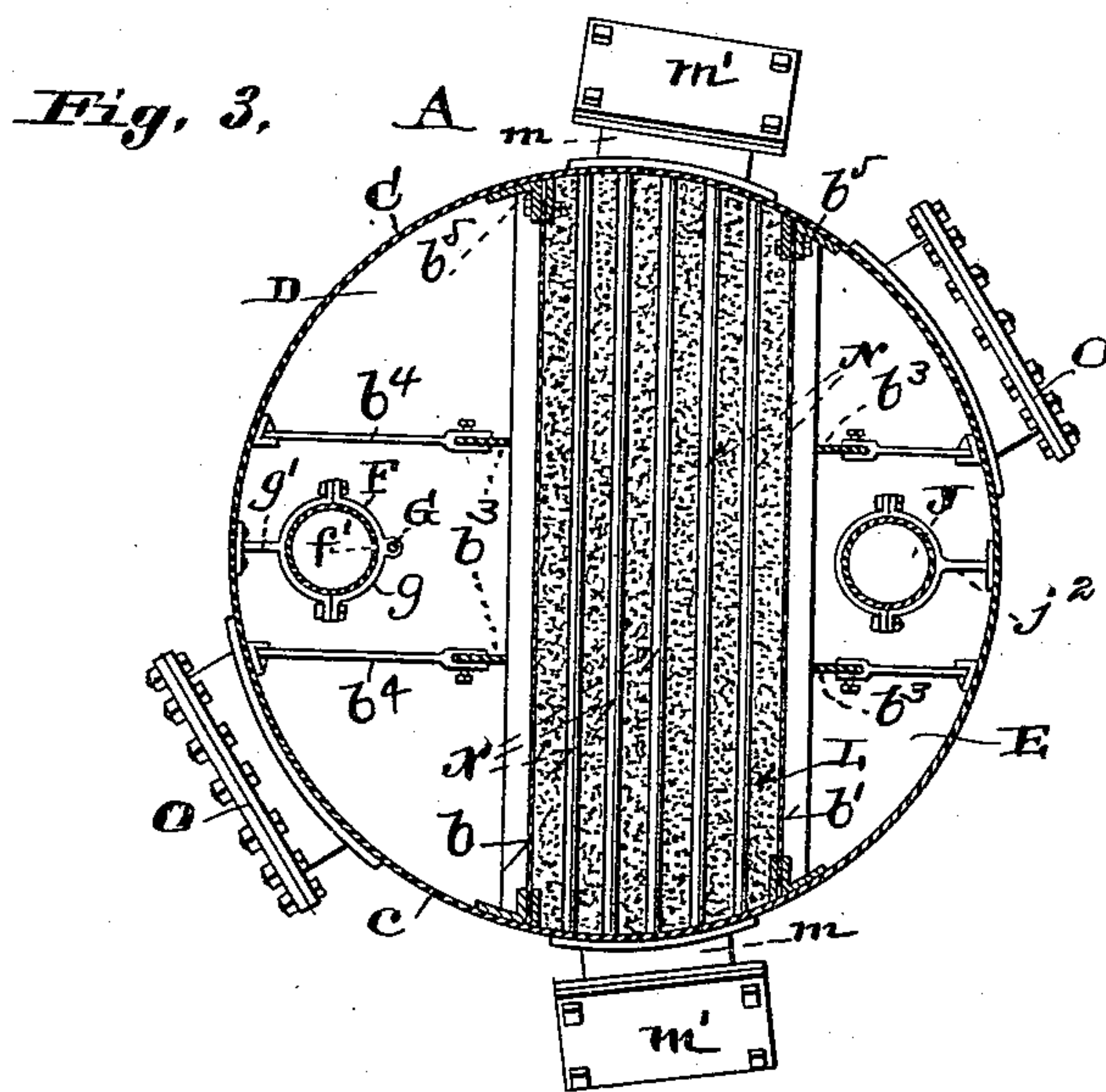
(No Model.)

2 Sheets—Sheet 2.

L. P. ANDREWS.  
FILTER.

No. 461,303.

Patented Oct. 13, 1891.



*Attest:*  
*Wm. Sanford*  
*W. H. H. H.*

*Inventor:*

*Lewis P. Andrews*  
*by E. B. Moody*  
*att'y*



# UNITED STATES PATENT OFFICE.

LEWIS P. ANDREWS, OF ST. LOUIS, MISSOURI.

## FILTER.

SPECIFICATION forming part of Letters Patent No. 461,303, dated October 13, 1891.

Application filed November 22, 1889. Serial No. 331,241. (No model.)

*To all whom it may concern:*

Be it known that I, LEWIS P. ANDREWS, of St. Louis, Missouri, have made a new and useful Improvement in Filters, of which the following is a full, clear and exact description.

By means of the improvements under consideration the water to be filtered is caused to flow through the filter-bed very evenly throughout the height and breadth thereof. Another feature is the means whereby the integrity of the filter-bed is maintained. An additional feature is the means whereby the filter-bed material is introduced into and withdrawn from the filter and the constitution of the filter-bed thereby more or less readily changed or renewed. The provision whereby the water in a measure is settled before being passed through the filter-bed, as well as certain structural features, is included in the improved construction, all substantially as is hereinafter set forth and claimed, aided by the annexed drawings, making part of this specification, in which—

Figure 1 is a vertical section of the improved filter on the line 1 1 of Fig. 2, which in turn is a vertical section on the line 2 2, Fig. 1; Fig. 3, a horizontal section on the line 3 3, Fig. 1; and Fig. 4, a plan of the filter.

The same letters of reference denote the same parts.

The most desirable construction whereby the invention can be carried out completely to the best advantage is an upright filter A, substantially as shown. The filter-bed B extends upward and downward in an upright closed cylinder C and divides the interior of the cylinder into two compartments D and E. The water to be filtered is delivered into the compartment D, whence it flows through the filter-bed into the compartment E, thence to be withdrawn to any desired point.

The filter-bed is composed of any suitable material, and it is confined in its position, so that the unfiltered water can flow into it and the filtered water flow out of it substantially throughout its height and breadth. This is accomplished, preferably, by inclosing the material between sheets  $bb'$  of perforated material and supporting the sheets by horizontal bars  $b^2$ , spaced apart, say, from four to twelve

inches, and supporting the bars in turn by upright stays  $b^3$ , braced by horizontal bars  $b^4$ , extending from the shell  $c$  of the cylinder. The bars  $b^2$  at the ends thereof are let into upright angle-irons  $b^5$ , which are fastened to the shell  $c$ . The water flows between the bars  $b^2$  to and from the filter-bed.

To effect the even delivery of the water to the filter-bed the water is delivered into the compartment D by means of the pipe F. This pipe leads into the compartment D, preferably from above the cylinder C, as shown, and extends nearly, if not quite, throughout the height of the filter-bed. In the present instance the pipe F terminates, as shown, a short distance above the bottom of the compartment, and it is closed by a removable cap  $f$ . The pipe F is of suitable cross-sectional area to suit the capacity of the filter, and in its side which is toward the filter-bed the pipe is perforated throughout its height, substantially, to provide for delivering the water into the compartment D. The perforation in the pipe F is preferably in the form of a narrow slit  $f'$ . The area of the slit is about equal to the cross-sectional area of the pipe. By this means the water is delivered into the compartment substantially throughout the height of the filter-bed.

To promote the lateral flow of the water, so that it shall be spread over the width as well as the height of the filter-bed, an upright bar G is arranged a short distance in front of the slit  $f'$ —that is, in the direction of the filter-bed, substantially as shown. The bar is sustained in that position by means of suitable clamps  $g$ , attached to the pipe F, and by extending these clamps from the shell of the cylinder, as at  $g'$ , they may also be made to steady the pipe F in its position. The current of water issuing from the pipe-slit encounters the bar G, which acts to divide the current and to deflect its two parts toward the filter-bed, but respectively toward the right and left hand portions thereof, and thereby practically to urge the current against the width as well as the height of the filter-bed. The compartment D becomes filled with water as soon as the operation of the filter is under way, and while that portion of the



water which is between the pipe F and the filter-bed is agitated by reason of the described current the remaining portion of the water is quieter, thereby providing opportunity for a portion of the impurities of the water to settle backward and downward into the lower portion of the compartment D, whence they can be withdrawn by opening a valve H and draining the compartment through the outlet-pipe I. The filtered water fills the compartment E, and instead of withdrawing the water therefrom through any single outlet, and thereby influencing the water-current from the point at which it enters the filter-bed in the direction of such single outlet, it is withdrawn from the compartment through many outlets distributed throughout the height of the compartment E, thereby influencing the water-current evenly through the filter-bed throughout its height, and thus utilizing the full height of the filter-bed. This feature of the improvement is carried out, preferably, by means of the vertical pipe J, of suitable capacity and perforated at many points  $j j$  throughout its height, substantially as shown, and extending from near the bottom of the compartment E upward through the compartment to above the same, where it connects with any discharge pipe or pipes J' J', controlled by valves  $j' j'$ . The water flows into the pipe J through the perforations  $j j$ , and thence is delivered through the pipes J' J' to any desired point. The braces  $j^2$  stay the pipe J.

The compartment E, in a manner analogous to that of the compartment D, serves also as a settling-chamber, and its sediment, by opening the valve  $e$  in the pipe  $e'$ , can be withdrawn through the outlet  $e^2$  and discharged to any desirable point—say into the pipe I. Another leading feature of the improvement is the provision whereby cracks, fissures, or other undesirable openings across the filter-bed, especially at the upper end thereof, are prevented. K represents a magazine arranged above and opening into the filter-bed and capable of containing any suitable quantity of the filter-bed material L.

In the event the material already composing the filter-bed settles, which it is likely to do more or less, a vacancy occurs at the upper end of the filter-bed, through which the unfiltered water can pass directly into the compartment E without being filtered. This difficulty is avoided by the means described. The surplus filter-bed material in the magazine K drops therefrom through the opening  $k$  into the filter-bed as fast as the material originally therein settles, and the completeness of the filter-bed is thereby maintained free from openings or crevices through which the unfiltered water can escape.

The magazine K has a removable top  $k'$ , and in the top may be a hand-hole  $k^2$ . This enables not only the magazine to be filled,

but the filter-bed to be replenished through the magazine.

The material L can be withdrawn from its position in the filter-bed at the lower end thereof through one or more outlets M M. By means of a suitable implement introduced through these openings the material can be drawn out, and to prevent trouble from the material dropping too freely outward from the filter when the outlets M are opened upwardly-inclined chutes  $m$  are employed. These chutes are extended sufficiently to bring the outer end thereof beyond the angle at which the filter material rests when allowed to drop downward and outward through the openings M. The chutes are closed by means of suitable covers  $m'$ . N N represent bars used to sustain in a measure the principal portion of the material L, so that it shall descend more gradually to the lower end of the filter-bed. O O are man-holes.

I claim—

1. In a filter, the combination, with the vertical cylindrical casing, of the vertical filter-bed dividing said casing into a supply-compartment and a receiving-compartment D E, respectively, the vertical split supply-pipe descending to a point near the bottom of the compartment D, and the vertical perforated collecting-pipe descending to near the bottom of the compartment E, substantially as specified.

2. In a filter, the combination, with the casing and the vertical filter-bed inserted therein and forming the supply-compartment D, of the vertical supply-pipe descending into said compartment to near the bottom thereof and provided with a vertical discharge-slit having an area about equal to the transverse area of the supply-pipe, so that the latter will in operation discharge from the entire length of its slit, substantially as specified.

3. In a filter, the combination, with the casing and the vertical filter-bed forming the compartments D E therein, of the vertical supply-pipe descending into the compartment D to near the bottom thereof and having a vertical discharge-slit facing the filter, and the vertical deflector-rod standing from and opposite to said slit and dividing the discharge of water therefrom, so that the water may be distributed equally and evenly over the filter, substantially as specified.

4. The combination, in a filter, of the upright filter-bed, the upright compartment D, and the upward-extended pipe F, having the slit  $f'$ , substantially as and for the purposes set forth.

5. The combination, in a filter, of the compartment D, the filter-bed B, the slotted pipe F, and the bar G, arranged in front of the slit in the pipe F to produce a lateral flow of water, substantially as described.

6. The combination, in a filter, of the com-



partment D, having in it the slitted pipe F,  
means, as described, to deflect the water pass-  
ing through the slit, the compartment E,  
having in it the perforated pipe J, and cen-  
5 trally between said compartments the filter B,  
all substantially as and for the purposes set  
forth.

Witness my hand this 13th day of Novem-  
ber, 1889.

LEWIS P. ANDREWS.

Witnesses:

C. D. MOODY,  
C. C. LOGAN.